

REMARKS/ARGUMENTS

Amendments are made to the specification for improved clarity and consistency in the use of reference numerals and terms, and to correct some typographical errors. No new matter is added.

Claims 1 to 81 are pending in the application.

Claims 1 to 81 stand rejected by the examiner.

Claims 1, 4, 9, 10, 11, 13, 19, 30, 40, 41, 43, 56 to 58, 60 and 74 to 78 are amended for purposes of improved clarity and consistency of terminology, for example to provide proper antecedent basis for certain terms. For example, claims 9, 19, 56 and 74 are amended to recite that "the sensor is formed in a substrate..." in order to provide proper antecedent basis for recitation of the substrate in later dependent claims. Claims 76 to 78 are amended to depend from claim 74 for this reason also.

Claims 10, 11, 13, 40, 41, 43, 57, 58, 60, 75, 76 and 78 are amended to replace the term "made" with "formed".

Claim 4 is amended to recite the first, second and third magnetic fields as first, second and third remnant magnetic fields, for greater clarity and consistency with the terminology of claim 1. The repeated text "a second magnetic field has" is deleted from the third line of claim 4 to improve clarity. In the sixth line of claim 4, "first, second and third magnetic fields" is amended to read "first, second and third magnetic flux fields" for greater clarity.

Claim 9 is amended to depend on claim 2, instead of claim 1, in order to provide proper antecedent basis for recitation of "the inner side of each of the first, second and

third segments". Claim 9 is also amended in line 2 to replace "said first magnetic field produces" with "said first segment produces".

Claim 30 is amended so as to replace "cross-section" with "shape" for improved clarity of terminology.

No new matter is added. No claims are added or cancelled.

The Examiner has rejected claims 1 to 16 under 35 USC 112 as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The Examiner states that the wording of claim 1 on lines 8 and 9, where it states that "wherein when said first, second and third remnant magnetic fields are in said the memory cell is in a second orientation", is vague and unclear.

Claim 1 is amended to recite "wherein when said first, second and third remnant magnetic fields are in said second direction the memory cell is in a second orientation". This amendment clarifies the language of claim 1 and overcomes the Examiner's rejection.

Claims 2 to 16 are rejected by the Examiner due to the rejection of independent claim 1, from which they depend. Applicants respectfully submit that the rejection of claims 2 to 16 is overcome by the amendment to claim 1, by virtue of their dependence on claim 1.

In the Office Action, the Examiner rejects claims 1 to 16 and 47 to 65 as being anticipated by Katti et al. (US Patent No. 5,289,410) under 35 USC 102(b). The Examiner bases his rejection on the assertion that Katti et al. disclose all of the features of independent claims 1 and 47, as well as the features of the claims depending thereon.

Applicants respectfully disagree with the Examiner's characterization of the disclosure provided by Katti et al. In Figure 1a and the corresponding description (column 4, lines 9 to 62), Katti et al. disclose a thin film magnetic element 1 disposed with one end thereof immediately adjacent to the sensing region of Hall sensor 2. Katti et al. do not disclose magnetic element 1 as having first, second and third segments each having first, second and third remnant magnetic fields. Rather, Katti et al. disclose a single magnetic element having a single magnetic field induced by write line 3. Further, as Katti et al. do not disclose first, second and third remnant magnetic fields within the magnetic element, Katti et al. cannot disclose the limitation of the memory cell being in a first orientation when the first, second and third remnant magnetic fields are in a first direction and the memory cell being in a second orientation when the first, second and third remnant magnetic fields are in a second direction. Accordingly, it is submitted that Katti et al. do not disclose all of the limitations of claim 1.

Claim 47 is distinguishable from Katti et al. on a similar basis to claim 1, except that, instead of reciting a magnetic element having three segments, claim 47 recites a memory cell having at least two magnetic elements. Claim 47 further recites a write line for storing a remnant magnetic field in each of the at least two magnetic elements. Katti et al. does not disclose a memory cell having at least two magnetic elements arranged to separately store remnant magnetic fields therein. Further, as Katti et al. do not disclose a memory cell having at least two magnetic elements, they cannot disclose the write line storing remnant magnetic elements in each of the at least two magnetic elements, nor can Katti et al. disclose the memory cell being in a first orientation when the magnetic fields of the at least two magnetic elements have a first direction and the memory cell being in a second orientation when the magnetic fields of the at least two magnetic elements have a second direction.

Katti et al. disclose using only a single magnetic element 1 as they rely on positioning the edge of the magnetic element 1 at the center of the Hall sensor so that the "fringing field" from the magnetic element passes through the center at a maximum (Column 4, lines 13 to 16). Accordingly, Katti et al. do not teach or suggest having two

magnetic elements providing cumulative magnetic fields operating on the sensing region because Katti et al. rely instead on positioning the edge of one end of a single magnetic element at the center of the sensor.

Advantageously, embodiments of the present invention provide multiple magnetic elements or segments having respective remnant magnetic fields oriented to pass through the sensing region in the same direction in one orientation, and in an opposite same direction in another orientation. These features are neither taught nor suggested by Katti et al.

Dependent claims 2 to 16 and 48 to 65 also include limitations concerning multiple magnetic elements or multiple segments of a magnetic element having separate remnant magnetic fields and, accordingly, it is submitted that these dependent claims are distinguishable from Katti et al. for reasons similar to those provided above in relation to independent claims 1 and 47, and by virtue of other features which are novel and non-obvious.

In the Office Action, the Examiner rejects claims 17 to 46 and 66 to 81 as being anticipated by Lienau (US Patent No. 5,295,097) under 35 USC 102(b). Lienau discloses a "magnetizable domain 19" of a generally cylindrical form (see Figure 1), with a loop member 18 "substantially surrounding the domain 19" (column 2, lines 45 to 66) and acting as a write line.

While Lienau discloses a magnetic element 19, the magnetic element is a linear magnetic element as it is in the shape of a cylinder of what appears to be a uniform cross-section. It is submitted that a plain cylinder is not properly characterized as "non-linear". Lienau therefore does not disclose a non-linear magnetic element as recited in claim 17. Further, the write line 18 taught by Lienau is arranged around the linear magnetic element so as to induce a remnant magnetic field in magnetizable domain 19 of a form appropriate for a linear cylindrical element. Lienau therefore does not teach or

suggest a write line for storing a remnant magnetic field in a non-linear magnetic element, as recited in claim 17.

Further, Lienau teaches abutting an end of the cylinder to a Hall sensor 36 so that magnetic flux lines having strong components orthogonal to the plane of Hall sensor 36 provided from the end of magnetizable domain 19. This is a similar sensing arrangement to that described by Katti et al. As described above in relation to Katti et al., embodiments of the invention do not rely on placing an end of the magnetic element at the center of, or immediately adjacent to, the Hall sensor. Instead, embodiments of the invention employ two or more magnetic elements or a magnetic element having two or more segments with respective magnetic fields for cumulatively acting on the sensing region in the same direction. The non-linear magnetic element of claim 17 enables separate sections of the magnetic element to have separate magnetic fields acting in the same direction and cumulatively on the sensing region. This is neither taught nor suggested by Lienau.

Further, Lienau does not disclose or suggest two or more segments of the magnetic element, where those segments are not co-linear and where each segment stores a magnetic field, as recited in dependent claim 18. Claims 19 to 46 depend on claim 17 and include the features thereof, together with further limitations. Claims 19 to 46 are therefore submitted to be distinguishable over Lienau for the reasons given above in relation to claims 17 and 18, and by virtue of reciting further novel and non-obvious features.

Claim 66 recites a memory cell having a magnetic element having a notched section. The magnetic element 19 of Lienau is of a cylindrical shape and is not disclosed as having a notched section. Lienau therefore does not disclose or suggest all of the features of claim 66 and claim 66 is accordingly distinguishable over Lienau.

Further, Lienau does not disclose a write line that is geometrically linear, as recited in claim 67. Rather, Lienau discloses a write line 18 which is non-linear and

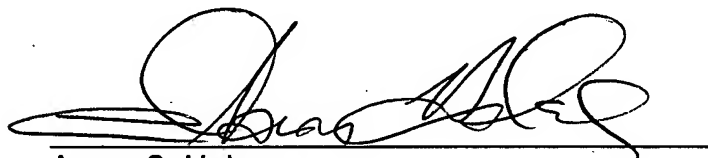
configured to perform its write function by being formed as a loop substantially surrounding magnetic domain 19. Accordingly, Lienau does not disclose or suggest the limitations of claim 67 and claim 67 is accordingly distinguishable over Lienau.

Dependent claims 67 to 81 depend on independent claim 66 and have all of the limitations of claim 66. Accordingly, dependent claims 67 to 81 are distinguishable over Lienau for the same reasons as described above in relation to claim 66 and by virtue of reciting further novel and non-obvious features.

Applicants respectfully request that a timely Notice of Allowance be issued in this case.

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Respectfully submitted,



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